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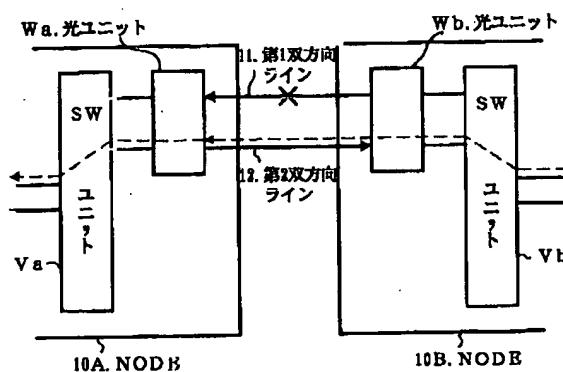
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(54) 【発明の名称】 双方向光モジュールを使用した光伝送システム

(57) 【要約】

【課題】光ラインに「断」が発生しても、十分なプロテクションが図れる上、システムの構成が簡単で、設備コストが低廉で済む光伝送システムを提供。

【解決手段】双方向光モジュールを用いる事により单一の光ファイバで双方向の光データを送信可能とした光伝送路からなる第1双方向ライン11および第2双方向ライン12を介し、光伝送装置10A、10Bを多ノード接続したラインプロテクション構成(or 2ファイバリング構成)の光伝送システムにおいて、ライン11の一方向はデータ挿入を行なう現用ラインとして用い他方向はプロテクションラインとして用いると共に、ライン12の一方向はプロテクションラインとして用い他方向はデータ挿入を行なう現用ラインとして用い、ライン11が断の時はライン11



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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the lightwave transmission system using bidirectional light MOJU 1 RU of the Rhine protection configuration which comes to make multi-node connection of two or more optical transmission devices, or 2 fiber ring transmission configuration by using especially a bidirectional light module about the lightwave transmission system which used the bidirectional light module through 1st bidirectional Rhine and 2nd bidirectional Rhine which consist of the optical transmission line which made optical data bidirectional with a single optical fiber ready-for-sending ability.

[0002]

[Description of the Prior Art] Drawing 3 is drawing showing an example of the conventional lightwave transmission system, and is the block diagram showing the lightwave transmission system of the Rhine protection configuration which makes multi-node connection of the optical transmission device, and changes.

[0003] In drawing 3, each of node (NODE) 30A and node (NODE) 30B is ADM (Add/Drop Multiplexer) equipment for performing junction transmission of insertion of a TORIBYUTARI (subordination) signal, separation, or a passage signal. Each ADM equipment is equipped with the switching units Xa and Xb, the present *** units Ya and Yb, and the optical units Za and Zb for reserves, respectively.

[0004] node 30A -- present -- business -- Rhine 32 and node 30B -- present -- business -- in node 30A and node 30B, data insertion is performed in Rhine 31, respectively. and Rhine 34 for reserves of node 30A and Rhine 33 for reserves of node 30B -- said -- present -- business -- it is used as a protection line in Rhine 32 and 31.

[0005] now, x mark in drawing shows -- as -- node 30B -- present -- business -- the case where "****" occurs in Rhine 31 -- this node 30B -- present -- business -- protection of Rhine 31 is carried out in Rhine 33 for reserves of node 30B. That is, data are transmitted via optical YUNITSU ** Zb for reserves, Rhine 33 for reserves, and optical YUNITSU ** Za for reserves, as a drawing destructive line shows.

[0006] Drawing 4 is drawing showing other examples of the conventional lightwave transmission system, and is the block diagram showing the lightwave transmission system of 2 fiber ring transmission configuration which makes multi-node connection of the optical transmission device, and changes. In addition, as a class of ring transmission system, it is UPSR (Unidirectional Path Switched Ring).

BLSR(Bidirectional Line Switched Ring)

***** et al. is sufficient.

[0007] In drawing 4, each of node (NODE) 40A - node (NODE) 40D is ring equipment for performing junction transmission of insertion of a TORIBYUTARI (subordination) signal, separation, or a passage signal. Rhine 41 and 42 shows Rhine which transmits the main signal data and overhead data between node 40A and node 40D.

[0008] Although the main signal which is pass level is relieved through a protection line when "<<" occurs in Rhine 41 as x mark in drawing shows now, the overhead between node 40A and node 40D will be in an interruption condition, without giving aid.

[0009]

[Problem(s) to be Solved by the Invention] The lightwave transmission system concerning the above-mentioned conventional example has the respectively following problems. the lightwave transmission system of the Rhine protection configuration shown [1st] in drawing 3 -- setting -- the present *** units Ya and Yb -- and -- present -- business -- corresponding to Rhine 31 and 32, since the optical units Za and Zb for reserves and Rhine 33 and 34 for reserves are surely required, each ADM equipment ***** has the problem that a system-wide configuration becomes complicated.

[0010] When optical Rhine between each node 40A-40D becomes [2nd] "<<" in the optical transmission gardenia fruit stem of 2 fiber ring configuration shown in drawing 4 , although the main signal is relieved, an overhead has the problem of being in an interruption condition.

[0011] The purpose of this invention is easy the structure of a system, when sufficient protection can be planned, even if "<<" occurs in optical Rhine, and facility cost is to offer the optical transmission gardenia fruit stem which used the bidirectional light module which is cheap and ends.

[0012]

[Means for Solving the Problem] In order to solve the above-mentioned technical problem, the lightwave transmission system which used the bidirectional light module by this invention 1st bidirectional Rhine and 2nd bidirectional Rhine which consist of the optical transmission line which made optical data bidirectional with a single optical fiber ready-for-sending ability by using a bidirectional light module are minded. in the lightwave transmission system of the Rhine protection configuration which makes multi-node connection of the optical transmission device, and changes, the one direction in said 1st bidirectional Rhine performs data insertion -- present -- business -- it using as Rhine, and the other directions, while using as a protection line The one direction in said 1st bidirectional Rhine and the one direction in said 2nd bidirectional Rhine which is the same direction are used as a protection line. the other directions perform data insertion -- present -- business, when it uses as Rhine and "<<" arises in said 1st bidirectional Rhine When it transmits by said 2nd bidirectional Rhine having carried out protection RAINHE insertion of the data of above-mentioned 1st bidirectional Rhine and/or "<<" arises in said 2nd bidirectional Rhine It is made to transmit by said 1st bidirectional Rhine carrying out protection RAINHE insertion of the data of above-mentioned 2nd bidirectional Rhine.

[0013] Moreover, the lightwave transmission system which used the bidirectional light module by other modes of this invention 1st bidirectional Rhine and 2nd bidirectional Rhine which consist of the optical transmission line which made optical data bidirectional with a single optical fiber ready-for-sending ability by using a bidirectional light module are minded. in the lightwave transmission system of 2 fiber ring transmission

configuration which makes multi-node connection of the optical transmission device, and changes, the one direction in said 1st bidirectional Rhine performs data insertion -- present -- business -- it using as Rhine, and the other directions, while using as a protection line The one direction in said 1st bidirectional Rhine and the one direction in said 2nd bidirectional Rhine which is the same direction are used as a protection line. the other directions perform data insertion -- present -- business, when it uses as Rhine and "****" arises in said 1st bidirectional Rhine It transmits by said 2nd bidirectional Rhine carrying out protection RAINHE insertion of the data of above-mentioned 1st bidirectional Rhine. Or when "****" arises in said 2nd bidirectional Rhine It is made to transmit by said 1st bidirectional Rhine carrying out protection RAINHE insertion of the data of above-mentioned 2nd bidirectional Rhine.

[0014]

[Embodiment of the Invention] Drawing 1 is drawing showing the configuration of the lightwave transmission system which used the bidirectional light module concerning the 1st operation gestalt (the best operation gestalt) of this invention.

[0015] By using a bidirectional light module, drawing 1 shows the lightwave transmission system of the Rhine protection configuration which makes multi-node connection of the optical transmission device, and changes through 1st bidirectional Rhine 11 and 2nd bidirectional Rhine 12 which consist of the optical transmission line which made bidirectional optical data ready-for-sending ability with a single optical fiber.

[0016] In drawing 1, each of node (NODE) 10A and node (NODE) 10B is the optical transmission devices of an ADM configuration. Each optical transmission device is equipped with the switching units Va and Vb and the optical units Wa and Wb. The transmission speed of 1st bidirectional Rhine 11 which consists of two optical fibers which have connected between each optical transmission device, and 2nd bidirectional Rhine 12 is STM-N (N is a positive integer).

[0017] the one direction in 1st bidirectional Rhine 11 performs data insertion -- present -- business -- it is used as Rhine. moreover, the other directions of 1st bidirectional Rhine 11 -- 2nd bidirectional Rhine 12 -- present -- business -- it is used as a protection line to data.

[0018] the one direction (the same direction as the one direction in 1st bidirectional Rhine 11) in 2nd bidirectional Rhine 12 -- 1st bidirectional Rhine 11 -- present -- business -- it is used as a protection line to data. moreover, the other directions (the same direction as the other directions of 1st bidirectional Rhine 11) of 2nd bidirectional Rhine 12 perform data insertion -- present -- business -- it is used as Rhine.

[0019] When "****" arises in the part shown by x mark of 1st bidirectional Rhine 11 according to a certain failure, 2nd bidirectional Rhine 12 carries out protection RAINHE insertion, and the data of 1st bidirectional Rhine 11 transmitted to node 10A from node 10B are transmitted to it, as a broken line shows.

[0020] Contrary to the above, when "****" arises in 2nd bidirectional Rhine 12, it transmits by 1st bidirectional Rhine 11 carrying out protection RAINHE insertion of the data of 2nd bidirectional Rhine 12.

[0021] according to the lightwave transmission system of the 1st operation gestalt shown in drawing 1, if optical Rhine serves as "****", the optical units Za and Zb for reserves since an optical cable new as a protection line was not necessarily used at that time, as protection RAINHE change **** showed in the conventional example etc. will become

entirely unnecessary, and a configuration will be simplified.

[0022] Drawing 2 is drawing showing the configuration of the lightwave transmission system which used the bidirectional light module concerning the 2nd operation gestalt (the best operation gestalt) of this invention.

[0023] By using a bidirectional light module, drawing 2 shows the lightwave transmission system of 2 fiber ring configuration which makes multi-node connection of the optical transmission device, and changes through 1st bidirectional Rhine 21 and 2nd bidirectional Rhine 22 which consist of the optical transmission line which made bidirectional optical data ready-for-sending ability with a single optical fiber.

[0024] In drawing 2, each of node (NODE) 20A - node (NODE) 20D is the ring optical transmission devices of an ADM configuration. Each optical transmission device is equipped with the switching unit, the optical unit, etc., respectively. The transmission speed of 1st bidirectional Rhine 21 which consists of two optical fibers which have connected between each optical transmission device, and 2nd bidirectional Rhine 22 is STM-N (N is a positive integer).

[0025] the one direction in 1st bidirectional Rhine 21 performs data insertion -- present -- business -- it is used as Rhine. moreover, the other directions of 1st bidirectional Rhine 21 -- 2nd bidirectional Rhine 22 -- present -- business -- it is used as a protection line to data.

[0026] the one direction (the same direction as the one direction in 1st bidirectional Rhine 11) in 2nd bidirectional Rhine 22 -- 1st bidirectional Rhine 21 -- present -- business -- it is used as a protection line to data. moreover, the other directions (the same direction as the other directions of 1st bidirectional Rhine 11) of 2nd bidirectional Rhine 22 perform data insertion -- present -- business -- it is used as Rhine.

[0027] When "##" arises in the part shown by x mark of 1st bidirectional Rhine 21 according to a certain failure, as a broken line shows the data of 1st bidirectional Rhine 21 transmitted to node 20A from node 20D, it transmits to it by 2nd bidirectional Rhine 22 carrying out protection RAINHE insertion.

[0028] Contrary to the above, when "##" arises in 2nd bidirectional Rhine 22, it transmits by 1st bidirectional Rhine 21 carrying out protection RAINHE insertion of the data of 2nd bidirectional Rhine 22.

[0029] According to the lightwave transmission system of the 2nd operation gestalt shown in drawing 2, also after Rhine of one of the two has become "##", the communication link between optical transmission devices will be secured, and it becomes reliable [an overhead].

[0030] the operation gestalt explained above -- conclusion ** and [1] -- the lightwave transmission system which used the bidirectional light module shown in the 1st operation gestalt 1st bidirectional Rhine 11 and 2nd bidirectional Rhine 12 which consist of the optical transmission line which made optical data bidirectional with a single optical fiber ready-for-sending ability by using a bidirectional light module are minded. In the lightwave transmission system of the Rhine protection configuration which comes to make multi-node connection of optical transmission device 10A and 10B-- the one direction in said 1st bidirectional Rhine 11 performs data insertion -- present -- business -- it using as Rhine, and the other directions, while using as a protection line The one direction in said 1st bidirectional Rhine 11 and the one direction in said 2nd bidirectional Rhine 12 which is the same direction are used as a protection line. the other directions

perform data insertion -- present -- business, when it uses as Rhine and "****" arises in said 1st bidirectional Rhine 11 It transmits by said 2nd bidirectional Rhine 12 carrying out protection RAINHE insertion of the data of above-mentioned 1st bidirectional Rhine 11. And/or, when "****" arises in said 2nd bidirectional Rhine 12, it transmits by said 1st bidirectional Rhine 11 carrying out protection RAINHE insertion of the data of above-mentioned 2nd bidirectional Rhine 12.

[0031] In the above-mentioned lightwave transmission system, when "****" arises in 1st bidirectional Rhine 11 When protection RAINHE insertion of 2nd bidirectional Rhine 12 is carried out, the data of above-mentioned 1st bidirectional Rhine 11 are transmitted and "****" arises in 2nd bidirectional Rhine 12 Since protection RAINHE insertion of 1st bidirectional Rhine 11 is carried out and the data of 2nd bidirectional Rhine 12 are transmitted, a new optical cable is not needed as a protection line at the time of the Rhine failure generating. For this reason, the optical unit for reserves needed conventionally becomes unnecessary, and can reduce a system scale. And it becomes possible from expensive optical units being reducible to aim at a large cost cut.

[0032] [2] Moreover, the lightwave transmission system which used the bidirectional light module shown in the 2nd operation gestalt 1st bidirectional Rhine 21 and 2nd bidirectional Rhine 22 which consist of the optical transmission line which made optical data bidirectional with a single optical fiber ready-for-sending ability by using a bidirectional light module are minded. In the lightwave transmission system of 2 fiber ring transmission configuration which makes multi-node connection of the optical transmission devices 20A-20D, and changes the one direction in said 1st bidirectional Rhine 21 performs data insertion -- present -- business -- it using as Rhine, and the other directions, while using as a protection line The one direction in said 1st bidirectional Rhine 21 and the one direction in said 2nd bidirectional Rhine 22 which is the same direction are used as a protection line. the other directions perform data insertion -- present -- business, when it uses as Rhine and "****" arises in said 1st bidirectional Rhine 21 It transmits by said 2nd bidirectional Rhine 22 carrying out protection RAINHE insertion of the data of above-mentioned 1st bidirectional Rhine 21. And/or, when "****" arises in said 2nd bidirectional Rhine 22, it is made to transmit by said 1st bidirectional Rhine 21 carrying out protection RAINHE insertion of the data of above-mentioned 2nd bidirectional Rhine 22.

[0033] In the above-mentioned lightwave transmission system, when "****" arises in 1st bidirectional Rhine 21 When protection RAINHE insertion of 2nd bidirectional Rhine 22 is carried out, the data of above-mentioned 1st bidirectional Rhine 21 are transmitted and "****" arises in 2nd bidirectional Rhine 22 Since protection RAINHE insertion of 1st bidirectional Rhine 21 is carried out and the data of 2nd bidirectional Rhine 22 are transmitted, also after Rhine of one of the two has become "****", the communication link between the optical transmission devices of a ring method will be secured, and it becomes reliable [an overhead]. That is, if the Rhine failure occurs, since optical Rhine will be conventionally relieved in this operation gestalt to the exaggerated head having stopped service since reserve light Rhine did not exist at the time of failure generating, overhead interruption is avoided.

[0034]

[Effect of the Invention] According to this invention, the optical transmission gardenia fruit stem which used the bidirectional light module which does the following operation

effectiveness so is obtained.

[0035] (1) Since a new optical cable is not needed as a protection line to failure generating when it applies to the lightwave transmission system of the Rhine protection configuration, the optical unit for reserves becomes unnecessary. Consequently, the structure of a system becomes easy and can reduce a system scale. And since expensive optical units are reducible, facility cost is cheap, ends and can aim at a large cost cut.

[0036] (2) Although reserve light Rhine does not exist since aid is given by bidirectional Rhine of another side even if a failure occurs in one bidirectional Rhine when it applies to the optical transmission gardenia fruit stem of 2 fiber ring configuration, the interruption of an exaggerated head is avoided and sufficient protection function may be demonstrated.

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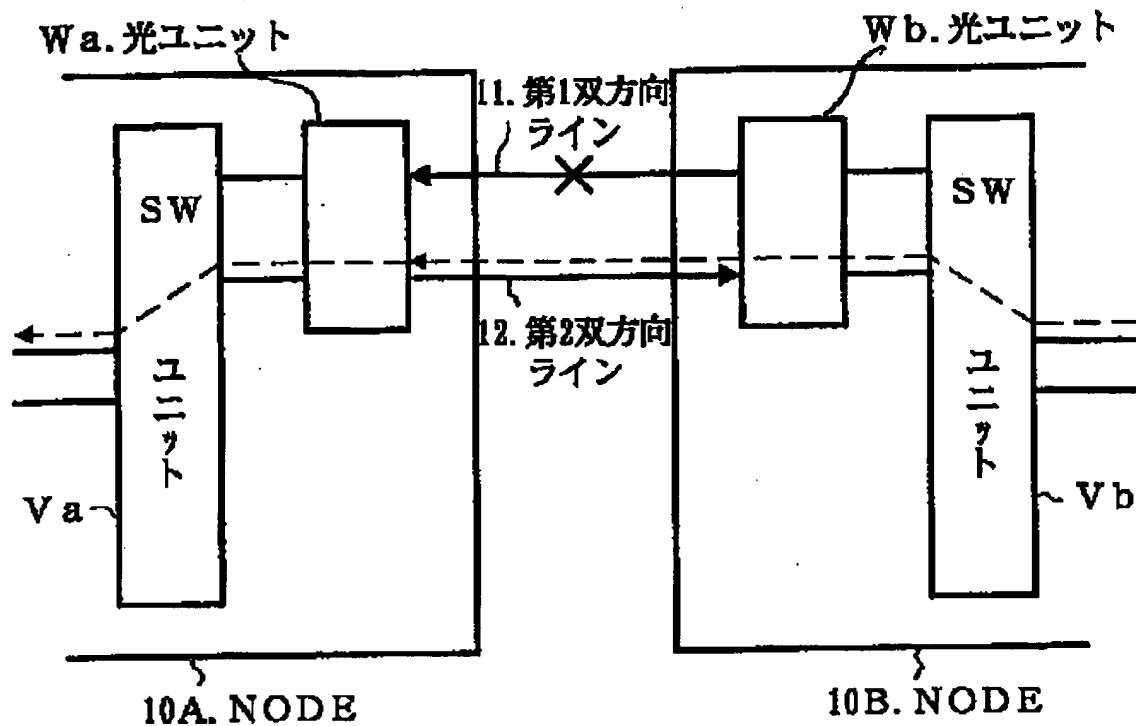
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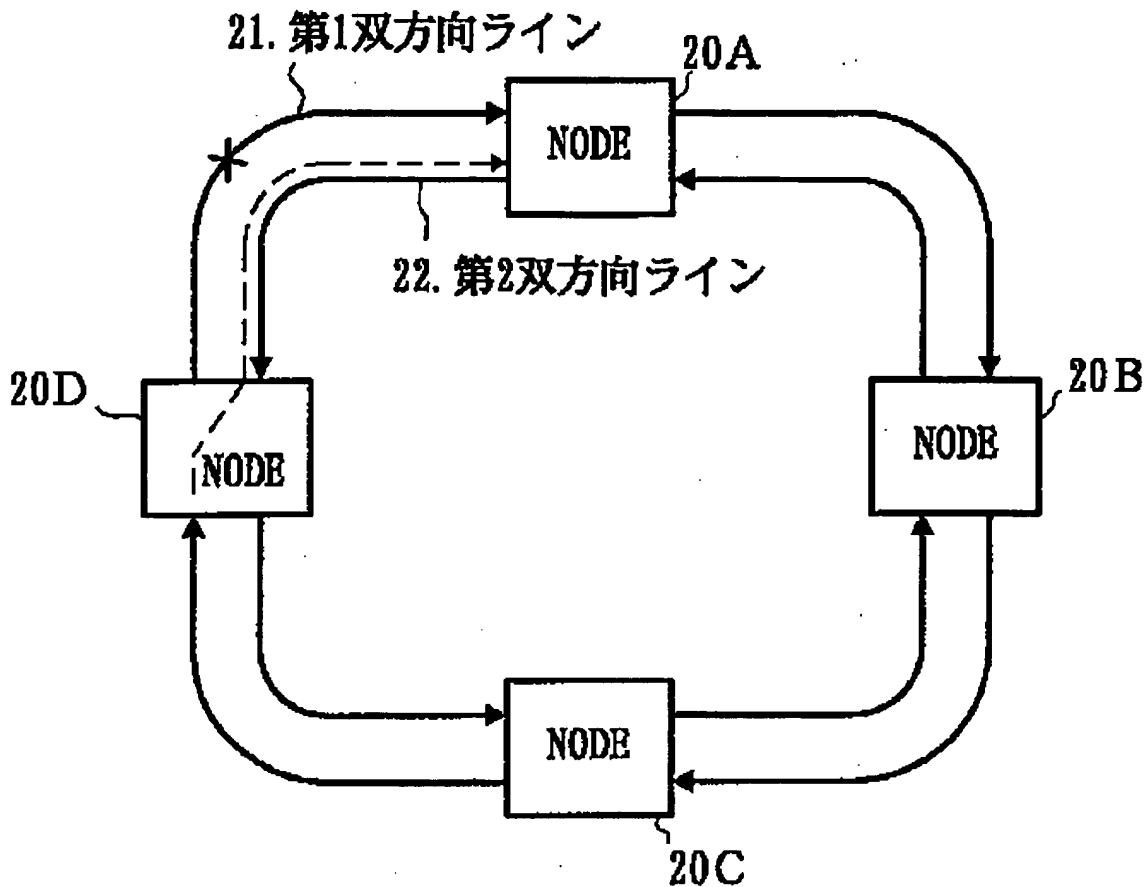
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DRAWINGS

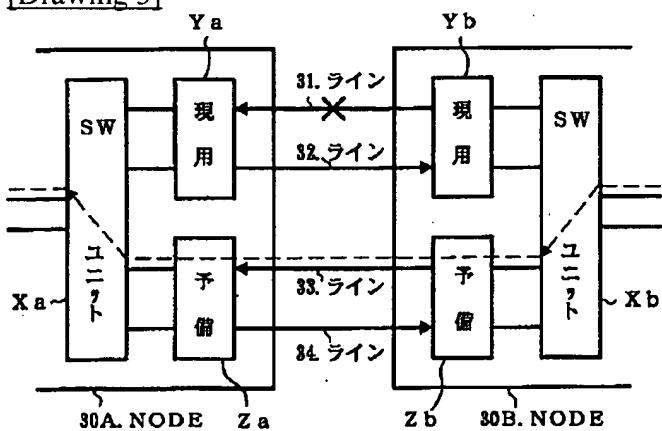
[Drawing 1]



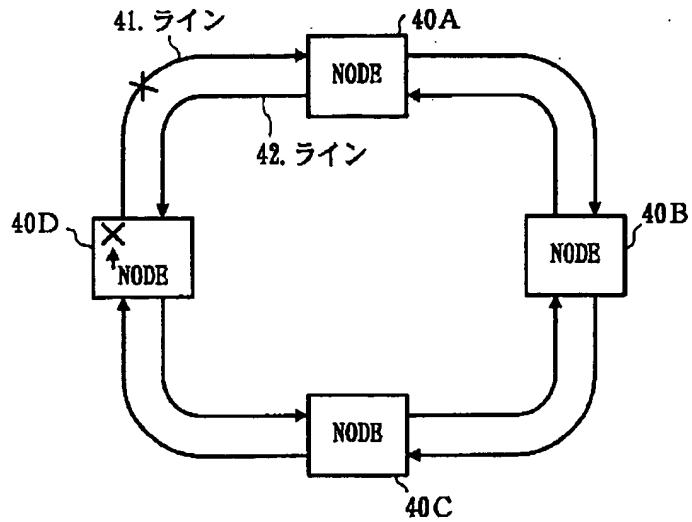
[Drawing 2]



[Drawing 3]



[Drawing 4]



[Translation done.]